

exhausting machine. As to ourselves, we thought the idea chimerical when it was first brought under our notice; but after reading a pamphlet on the subject by M. Francis Laur, of Saint-Etienne, we were forced to change our mind. The kind of safety-lamps that ought to be employed will form a subject of warm debate, but we can confidently assure the Commission that if they separate without recommending the universal adoption of lamps that will not continue to burn in an explosive atmosphere, and of more perfect locks than the present ones, they will have failed to satisfy one of the most important requirements of the time. We say this without prejudice to the means that may be thought best for examining the workings for accumulations of gas: we refer to the lamps supplied to the common workmen. The employment of explosive agents in getting the mineral, and other particulars relating to mines and mining operations include, we think, the most important of all the questions that will come before the Commissioners. What is coal-dust? and what bearing has it on the subject? If the presence of coal-dust is, after all, the cause of all these great explosions, and if, as has been once before asserted in these pages, great explosions never happen in damp or wet mines, but always in dry ones containing coal-dust, then surely the Commissioners would be but dallying with the subject if they omitted to carefully weigh all the facts that have been adduced in favour of this hypothesis. They will have to turn to other sources, however, than the reports of the inspectors of mines for information; and they might do worse than consult the report drawn out by M. Haton de la Goupillière of the doings of a similar commission appointed by the French Government in 1878, under the title of *Rôle des Pous-sières de Charbon*, in which they will find it alluded to, and an historical account given of the steps that have led to our present knowledge regarding it. Otherwise the literature of our own country is not quite so sterile in this respect as it was three years ago; but doubtless the Commissioners will provide themselves with all the most recent information.

The dangers due to the use of explosives in mines are of three kinds: firstly, the shot may ignite an accumulation of gas directly; secondly, it may effect the same thing indirectly by driving the flame of a safety-lamp burning in the accumulation through the meshes of its wire gauze cylinder; thirdly, the sudden rush of flame and the violent disturbance of the air caused by a blown-out shot (that is to say, one which expels its tamping without bringing down or even breaking the rock) may raise and ignite the coal-dust in front of it, and more especially if it is directed towards or parallel with and near to the floor. In the last case the flame has been often known to extend to a distance of thirty, forty, and even eighty yards from its origin, and such a disturbance taking place under favourable conditions is quite sufficient to initiate explosions such as those of Blantyre, Haydock, Abercarne, and Dinas, in which close upon a thousand lives have been lost within the last eighteen months. When we add that each of these mines was very dry and contained plenty of coal-dust, and was not known to contain more than insignificant accumulations of fire-damp, quite insufficient to account for a tithe of the

extent and violence of the explosions, we have said enough, we think, to make it apparent how pressing is this matter.

Blasting operations can be safely carried out in any mine if the shots are not fired near explosive accumulations, if the lamps are of such a construction that they cannot burn in an explosive atmosphere, and if the mine is a damp one. It is easy enough to provide the two first requirements, and it is obvious that by plentifully watering the roadways we can turn a naturally dry mine into a damp one and avoid danger such as we have described from blasting, as well as localise explosions of fire-damp. We have seen it stated in a footnote at p. 661 of the last number of the *Bulletin de la Société de l'Industrie Minérale* that dusty mines, which are at the same time well ventilated, may be watered frequently without obtaining permanent humidity. Fortunately, however, we are in a position to point to an example which has come under our own immediate notice, of an extensive mine in which the workings are kept damp throughout their whole extent by a constant application of water. In the case to which we refer the daily output of coal is 800 tons, the temperature of the workings is between 70° and 80° Fahr., and the amount of air passing into and out of the mine is between 80,000 and 90,000 cubic feet per minute.

In conclusion we are eminently satisfied that science is so well represented on the Commission; and if its various members will pull together like a well-balanced team, we anticipate the happiest results from its researches and labours.

KINGZETT'S ANIMAL CHEMISTRY

Animal Chemistry; or, The Relations of Chemistry to Physiology and Pathology. A Manual for Medical Men and Scientific Chemists. By Charles Thomas Kingzett, F.C.S. (London: Longmans, Green, and Co.)

FOR many years the want of a good manual of physiological chemistry or animal chemistry in the English language has been a standing reproach to English science. The causes of this want are not far to seek. Physiology has not many votaries in England, and physiological chemistry, being in interest one step farther than physiology from the verge of medical practice, has still fewer followers. The number of possible writers of a text-book of animal chemistry has, therefore, been small; and, among them, the number of men whose capability and opportunities for such an undertaking might justly have led them to hope for a successful issue to their labours has, it is needless to say, been smaller still. The qualifications to be looked for in one who attempts the task of writing such a manual are indeed not slight. He must be a thoroughly trained chemist whose judgment has been much exercised in the appreciation of chemical questions; he must be a physiologist with a sound and direct knowledge of most of the practical methods of physiology; he must be an anatomist who is fairly well acquainted with the microscopic structure of animal tissues; and he should have some insight, exact if not special, into morbid processes and pathological states. We need not wonder, then, that the labourers have been few.

The absence of any very recent English work of the kind does not lighten the difficulty of writing one; but the disadvantage of this absence is not so great as it might at first sight seem; for on the Continent there are text-books which in case of need might have served as a standard or lay-figure.

The difficulties of the task have, therefore, without a doubt, been many; but the task itself should not have been hopeless or ungrateful. English workers in physiological chemistry have at present to betake themselves to Hoppe-Seyler, Kühne, Gautier, Gorup-Besanez, for the chemico-physiological facts they stand in need of. English students have to make do the brief sections on Animal Chemistry—admirable, but of necessity imperfect and categorical—contained in the English text-books of physiology. Hence an English book specially devoted to animal chemistry, if at all exhaustive, accurate, and modern, would be likely to bespeak for itself a hearty welcome, and a disposition to extenuate its shortcomings.

Such were the prospects, unfavourable and favourable, of an attempt to fill up the book-shelf of English workers in natural science by a manual of animal chemistry. We turn to Mr. Kingzett's book, and, after a careful and reiterated perusal of it, we can say that never was attempt so rashly undertaken. We had expected a sound, if modest, substratum of physiological knowledge, and we find slipshod notions and the speculations of the amateur. We had expected apposite illustrations from pathology, and we find, in most cases, trivial and meaningless references to disease. We had expected a complete and careful account of the more purely chemical portions, and we find a degree of imperfection which sends us back with thankfulness to the chemical sections of Foster and Hermann.

Nor is this all. The book is styled a book of animal chemistry, and we therefore expected animal chemistry; but in addition to the sections so called we find scattered here and there reflections on life, character, and the morals of scientific work which, even were they not mere platitudes, would be utterly out of place in a work like this.

These strictures may seem severe, but they would not be wholly unexpected by any one who had read Mr. Kingzett's preface. He says:—"For four years I was occupied with the practical study of subjects comprehended in the following chapters, and during the whole of that time there were no fluctuations in the success attending the labours in which my services were involved. . . . It was therefore a matter of sincere regret with me that circumstances (which are said to be stronger than men) ultimately necessitated the discontinuance of my connection with work which had given me so much real pleasure." Then follows a page or so of reflections on the pleasure to be derived from original investigation; comparisons of the "scientist" and the "sentimentalist;" and so forth. "It was natural, then," he continues, "that, having experienced so much pleasure, I should be moved with equal regret in resigning the practical study of physiological chemistry; and in order to complete a well-remembered but brief connection with this subject, I determined to attempt a task which should prove of service to scientific men, namely, to collect and systematise,

as far as could be, all the trustworthy work on record in relation to animal chemistry, so far as it concerns the human body." We submit that four years' practical work at a subject like animal chemistry, be the success of the worker never so unfluctuating, is hardly warrant enough to undertake that which taxes the matured judgment even of a master, viz., the making of a useful and comprehensive text-book. Nor do we perceive that Mr. Kingzett's desire to signalise his departure from the field of chemico-physiological research adds any urgency to the warrant. We hope to show in the sequel that this prefatory confession on the part of the author, of practical unpreparedness for the task he had set himself to do, is fully borne out by the internal evidence of the book.

Mr. Kingzett does not profess to have included any account of the practical methods of the science. This, while it much lightens the labour of writing the book, is, we think, doubly to be regretted; because the book is to be read by medical men, who are not supposed in every case to remember chemical methods, and by scientific chemists who cannot be expected to know, for example, the modes of practising fistulæ, or rapidly removing blood from brains intended for analysis.

Mr. Kingzett's haphazard preparation for his task is well displayed in his seeming ignorance—not of the latest, but even of the penultimate—advances of the chemistry of physiological processes. Thus, while treating of peptones, whether in this part (p. 63) or on p. 386, Kühne's well-known and suggestive researches on the action of the digestive juices on proteids are inexplicably omitted; and nowhere, indeed, is the formation of peptones and their relationship to the albuminous bodies attempted systematically or adequately to be discussed. In treating of pancreatic juice the beautiful and conclusive work of Heidenhain on the production of the active ferment—a subject surely of the first chemico-physiological interest—is not once referred to, and indeed, by implication, ignored. (Cf. p. 70, where the preparation of extracts of pancreas is briefly described without any caution being given as to the time the pancreas should be let stand before being used.)

The inaccuracy of the author may be illustrated by a reference to pp. 49 and 60. There the effects of alkalis and acids of various strengths in amylolysis and proteolysis are mis-stated, and the important inferences from the facts altogether ignored.

Let us now turn to the chapter on the blood in Part III. Here, if anywhere in the book, we should expect to find completeness and the traces of careful work. On the contrary, on turning up Coagulation (p. 144)—the much-investigated, if not best-understood, process of the blood—we find the phenomenon itself imperfectly stated, the retarding influence of alkaline salts described without any quantitative conditions being given, and the theory of A. Schmidt discussed so slovenly and unintelligently that the important *fibrin-ferment* is nowhere directly treated of, but only implied (p. 146), if, indeed, it is not confused with paraglobulin. (See p. 146, the first paragraph, and p. 144, the second paragraph: the various statements taken together will, undoubtedly, bear such an interpretation.)

The blood as a respiratory tissue fares no better (p.

165). What are we to think of a manual of animal chemistry in which the author treats of the gases of the blood in mere general terms without reference to quantities? or what of one in which the author, among the spectroscopical properties of hæmoglobin, forgets to mention the shortening of the spectrum and the situation of the absorption-bands, or even the chemical method of deoxidation? What are we to think of the judgment of an author of such a manual who refers only to Bert and Fernet among those who have studied the affinity of hæmoglobin for oxygen (p. 166)? And what of the erudition of one who considers the following statement (p. 167) a sufficient discussion of the liberation of CO_2 in the lungs?—"It is easy to understand how the free carbonic acid is liberated, but not so simple to explain the liberation of that part previously in combination with alkaline bases. Thudichum supposes that when the venous blood reaches the small breathing cells the hæmato-crystalline is partly oxidised into what he calls hematic acid, and this, passing into the serum at the same moment, decomposes the carbonates in the blood, setting free carbonic acid, which, with the watery vapour, escapes through the lung tissue into the respiratory passages."

The salts of the blood are dismissed with bare enumeration.

But it is in the section on Food and the oxidations of the body (in Part II.), that the author discovers the appalling inaccuracy of his physiology. In many statements he seems to assign great importance to oxidations occurring in the blood and even in the lungs. Thus on p. 152 he speaks of "alcohol which must be placed side by side with fat as a respiratory food or substance which admits of oxidation in the lungs." Again (p. 154), "From the fact that oxidation in the lungs is a process of combustion and the source of muscular power, the foods which undergo this process are termed heat-producers; but we shall see presently that it is by no means clear that blood oxidation is attended directly with the evolution of animal heat": (he is here alluding to certain views of a Dr. Hake to be immediately referred to). In other parts of the book, also, the same exaggerated importance seems to be attached to oxidations in the lungs and blood. Thus, at p. 321, he inclines to the view that "the cerebro-spinal system does not generate its own force, but derives it through the chemical changes of the lungs." See also at p. 463, where a similar statement is included in the chapter on "Character." And finally, on p. 198, speaking of the seat of production of urea, the author says that "more modern researches tend to show that vitality consists more in the changes occurring in the blood, and that these changes may result in the direct production of urea."

These statements are clearly made in the spirit of those who hold that the interior of the blood-capillaries is the arena of oxidations, if they do not indeed take us back to the view of Lavoisier, who considered the lungs to be the heating-furnaces of the body. The latter view, we need hardly say, was long ago given up: the former is not seriously advocated by any recent physiologist. The lungs and the blood, like most of the organised tissues, doubtless suffer oxidation in the performance of their functions; but the degree of it is unimportant as a source of heat compared with the universal oxidation

of other active organs. Had the author adhered throughout to the view under the influence of which the above statements were set down, he would at least have escaped the charge of inconsistency. But this was hardly possible. In the course of his reading and extracting among modern papers for the purposes of this book, he could not but meet references, direct or implied, to the generally received doctrine of the origin of animal heat in the functional oxidations of tissue-cells; and we therefore find that, side by side with the false, the true doctrine is taught.

But, notwithstanding that Mr. Kingzett's physiology, even at a point which peculiarly affects the chemist, is unsound and wavering, he yet ventures to enlarge upon matters of mere speculative interest which have but a superficial connection with his subject. We shall quote the author's own words at the page where the subject is most fully dealt with, though by no means the only page where it is to be found. We are very sorry we cannot give the whole of it. The author is citing in his own words—and citing with approval—the views of Dr. Thos. G. Hake, M.D., F.C.S., which are contained in a paper entitled "On Vital Force: its Pulmonic Origin and the General Laws of its Metamorphoses," 1854 and 1867. "He (Dr. Hake) believes that the chemical changes as they occur in the blood system, and comprised in the act of oxidation, do not result in the evolution of heat, but force, which becomes electric by the agency of the blood corpuscles; and it is certain that this is perfectly consistent with what we know of cell-life. On this hypothesis, the blood-cells form chains and conductors for the electric current thus generated, and this is subsequently metamorphosed into heat at every point of the system. On reaching the cerebro-spinal centres it becomes vital force—another name for electric force—and this becomes eventually heat, namely, when it is transmitted to enable the consummation of vital acts, such as sensation, muscular motion, or secretion. Faraday and Du Bois Reymond, and hosts of other experimental inquirers, have insisted on the identity of electrical and vital force, and the experiments of Du Bois Reymond in particular, go to prove that nerve force is only electric force manifested through media not met with out of the living bodies." . . . "Our author even goes further, and with consummate skill, reasons that when this cerebro-spinal force is united in action within the same organic medium with other forces influencing us from without, viz., light, sound, heat, &c., new results are attained, and phenomena of sense and intelligence are observed." Why, he goes on to ask (whether the question is Mr. Kingzett's own, or only Dr. Hake's, endorsed by Mr. Kingzett, is not clear), why, in anæmia, does the brain lose somewhat of its intense vital force? "Because," he answers, "the source of vital force, viz., blood oxidation, is interfered with."

We have merely to add, before leaving this section, that, as a matter of course, the fine investigations of Prof. Hermann into the chemical changes in contracting muscle, upon which so much of our knowledge of cell-function in its chemical aspect is based, seems to have eluded Mr. Kingzett's eye altogether.

Part V. Mr. Kingzett heads "Chemical and Philosophical Subjects." We shall say nothing further respecting

the chemical part; for a treatise having the pretensions of the book we are reviewing, it is notably incomplete. English students and medical men who wish to inform themselves in the chemistry of the animal tissues will find far more to their purpose in Prof. Gamgee's annotated edition of Hermann, or Mr. Lea's Appendix to Foster, than they will find in Mr. Kingzett's Manual.

The last chapter but one of the book is devoted to a discussion of "Character." This, not being a chemical subject and not a physiological one, we presume Mr. Kingzett includes under the title "philosophical." Why Mr. Kingzett should select "character" out of the multitude of extraneous subjects; why "character" should be called specially a "philosophical" subject; and why it was deemed advisable to serve up scraps of philosophy at all in a "Manual of Animal Chemistry;" are difficulties which at once arise in our mind as we peruse the list of contents, and which are nowhere fully explained on closer inspection of the book. It is true that when we come to find that by "Character" Mr. Kingzett does not exactly mean character, but the whole mental and moral nature of man and its, at present, inexplicable connection with his physical nature, the difficulties recede if they do not diminish. They are certainly not entirely effaced. If the pure physiologist is content for the present to leave such subjects to the psychologist, the chemist must recognise, when he takes them up, that he does so quite gratuitously. But whether or not it is expedient to undertake discussions on psychology in chemical books, it is at least expedient, if they are undertaken, that they should be sensible and to the purpose; that they should not be encumbered by commonplaces or crude analogies; and that they should be got over as quickly as possible. Although it is a pity to disturb the order of Mr. Kingzett's reflections with the scissors, only space is granted us for a paragraph or so. They shall be neither worse nor better than the rest; and we strongly advise those readers who are in search of amusement to borrow the book and read the whole chapter.

He begins: "Character is almost universally regarded as something apart from the body of man himself; something for which man is individually responsible, something which, born with man, is developed and cultured into maturity by education and training, be that mature state one for evil or one for good." Mr. Kingzett does not appear to believe this, whatever it may mean; for he continues by way of antithesis, "Let first causes be what they may, and so also let us hide our face from the infinite future and regard man as an intelligent machine, complete, so far, in himself." This resolution having been taken, the difficulty of justly judging men's thoughts leads up to a magnificent simile: "And thus man never understands his fellow-man aright; he picks out a few crystalline threads of an individuality; he sees a few bright or black bands in the spectrum of his neighbour's life, and without touching the colloid mass which will not crystallise, and being blinded to those parts of the spectrum which are not revealed (*sic*), man judges his fellow."

The characteristic of man among living animals is then summed up in the following startling epigram: "In short, man is a cerebrating creature, as the cow is a ruminating creature;" and we immediately afterwards learn that he

cannot help cerebrating. Nor, it appears, can he help being a genius—or the reverse—if his brain-cells are fitly formed and he has been judiciously trained,—“and it is quite true that brain-cells do differ in form and composition just in a similar sort of way (!) as lungs and hearts differ.”

This naturally leads to the question of moral responsibility, and the difficulty of the materialist is thus stated: "Man, the result [*i.e.*, 'of a predetermining influence in the very foetus'], steps on to the platform of life in some measure at least an automaton. He is born of others, and finds himself with a head upon his shoulders, but the quantity and quality of brain-matter in the head is not ordained of himself. He may be a genius; but, horror! he may prove a fool!"

We then reach what appears to be the *raison d'être* of the chapter, viz., a conclusion which however nowise follows from any premisses before stated: "Thus even mundane chemical science has a part to play in the rôle of what poor mortals call their souls; it has something to do with every poem (*sic*) originating in the mind of the poet, with every transcendent hope of the philosopher, with the logic of a Mill, and the teeming intelligence of all."

Mr. Kingzett is then arrested by the thought that all the body, brain-cells included, are elaborated from food—a thought which leads him to exclaim, "Eat, drink, and be merry, for verily that which we eat and drink takes part in that with which we think!"

This is Mr. Kingzett's treatment of "character" as a philosophical subject! We can only say, as Dryden once said in a criticism of a play of Elkanah Settle's, "I am mistaken if nonsense is not here pretty thick sown." We challenge any one to find us five such pages of silly reflection and irrelevant twaddle in any other seriously-intended work.

At the end of the book there is an "Index of Authorities Quoted"—not, of course, the Index of the book. Turning up the K's, we find Mr. Kingzett's own name, and under it we discover that Mr. Kingzett is an "authority" on Character—the reference to the book being to p. 462, the very chapter we are discussing. As it nowhere appears that Mr. Kingzett has, in other places, treated of this subject, we have the happily rare spectacle of an author endeavouring to take time and the critics by the forelock by writing himself down an "authority" ere he knows his book will live. Sure self-complacency never touched a loftier pinnacle!

After this, a good anti-climax might have been regarded as hopeless; but Mr. Kingzett has achieved one. He closes his book with a list of "Suggested Matters for Research," in the hope and belief (as he tells us in his preface) that they may be a guide to the "scientific chemist." The "scientific chemist," if he has but a smattering of physiology, will know how to shrug the shoulder at such puerile, general, and useless suggestions as the following:—

"(1) The chemical composition and formula of ptyaline; its chemical relationship to albumin; a proper explanation of its ferment-power, and a better study of its general nature."

"(7) An explanation of the oft-recurring deposition of biliary matters near the pyloric end of the stomach."

"(18) The complete composition of lymph, chyle, and blood."

"(19) Particular studies of the blood-corpuscles."

"(40) Prolonged studies of the physics of the body directed particularly to work out the history of the force generated in blood oxidation."

OUR BOOK SHELF

The Patentee's Manual. By James Johnson and J. Henry Johnson. Fourth Edition. (London: Longmans and Co., 1879.)

THE law relating to letters-patent for inventions, as at present administered, has been the growth of one short sentence in a declaratory statute passed in the twenty-first year of the reign of James I. (A.D. 1623), by which the Crown was restrained from making extravagant or oppressive grants of monopolies. The history or details of patent cases may often form an interesting subject of inquiry for the scientific reader; for although men of the highest intellect may be content with the discovery of general laws, and may leave their useful application and development to the crowd of humbler followers whose only power consists in the exercise of mechanical ingenuity, yet it cannot be denied that the successive steps which have been made in the steam-engine, in the electric telegraph, in machinery for spinning, weaving, or sewing, for manufacturing paper, or for printing a newspaper, may each in turn afford matter of considerable interest to a philosopher whose imagination is wearied with an endeavour to trace the fantastic excursions of a molecule, or to carry his dynamical laws into new and unexplored regions.

A book which shows the manner in which the property in inventions is dealt with in our Courts, and which, in order to accomplish its object, must of necessity review the various cases in an historical and logical order, affords, in a small compass, an epitome of much valuable learning. It is remarkable that the first patent case of any importance involved the validity of Arkwright's invention of machinery for drawing out and spinning cotton (A.D. 1785), while the second occurred ten years later, and related to the invention of the separate condenser of a steam-engine by James Watt. Since that period a number of distinct steps in the useful application of physical or mechanical laws have successively passed the ordeal of judicial inquiry, and those who take up the volume before us will find a reference to such matters as Wheatstone's telegraph, the hot blast for smelting iron, the interlocking of railway points and signals, the operation of currents of air between the grinding surfaces of mill-stones, the combing of wool, the laying of submarine telegraph-wires, &c., and so on in a list which appears almost interminable.

But although the variety of subject-matter may be great, the principles which govern the cases are few and easily comprehended, and, in reading the statements of principles laid down by Chief-Justice Tindal and other judges who have moulded our patent law into a coherent form, the thought may arise that the purely scientific writer who is composing his manual for the use of students might with advantage borrow something of power of style and of clear logical exposition from the lawyer, who is popularly believed to be tied down and hampered by the jargon of technical phraseology.

The book now under notice has already passed through three editions, and the authors have enlarged it by the interpolation of recent cases, as well as by the addition of new chapters. It is not within the scope of this journal to examine such a treatise from a strictly legal point of view, but we should describe it as exhibiting abundant evidence of being the work of writers who are practically engaged in professional pursuits. One important appendix

consists of a digest of the patent laws in force in foreign countries, and in the body of the work there is a chapter on the "oppositions to the grant of patents," which suggests many melancholy thoughts to the sanguine inventor, and leads one to hope that some improvement of the enactment of 1852 will be conceded at an early period. In conclusion we have only to say that the book has fairly earned the circulation which has carried it to a fourth edition.

T. M. G.

A Manual of the Carbon Process of Photography, &c. By Dr. Paul E. Liesegang. Translated from the German by R. B. Marston. With Illustrations. (London: Sampson Low, Marston, Searle, and Rivington.)

WHEN, forty years ago, Mungo Ponton discovered that a sheet of paper, moistened with a solution of potassium dichromate, became darker when exposed to the rays of the sun, he made the first of a series of experiments which have led to the discovery of a method of rendering photographic pictures as permanent as engravings made in printing ink, though the completion of the work to a point at which it could fairly be said to be capable of competing with the well-known silver chloride print was not made till nearly thirty years afterwards, when Swan, by an admirable series of inventions, made it a practical means of producing prints.

In the history of the long struggle with nature which has produced so great a result every Englishman has reason to be proud, for it may be fairly said that the world owes the process from first to last to English workers. The process is now worked on an immense scale in this country by the Autotype Company and others, while another branch of the same stem has developed into the well-known Woodbury-type system of press-printing. Notwithstanding, however, the success of the process in its original home, we are somewhat deficient in connected accounts of it, most of the English publications on the matter being, like the autotype manual, confined to working details of the methods in use. We therefore welcome Dr. Liesegang's work as attempting something more than this, and presenting what is really a most interesting account of the whole subject, interesting, indeed, to any one who has a taste for well-written scientific technology, and apart from its value as a manual for actual working details. In one respect, indeed, the carbon process has all through been singularly fortunate. It seems, from the first, to have fallen into competent scientific hands, and to have escaped the dreary round of mess and muddle experimenting which is so characteristic of the history of the collodion negative processes, and which reminds one of nothing so strongly as of the story ascribing the invention of a certain process for the purification of sewage to its inventor going into a laboratory and taking down bottles at random, to the number of some half dozen, adding their contents to a sample of sewage, and patenting the mixture. From this misfortune the carbon process has been free, and Dr. Liesegang has been able to make its history instructive and interesting; he has given clear and precise accounts of the processes in use, and we note that he has kept well up with the latest improvements, while the illustrations are well and clearly cut. The popularity of the work in Germany has caused no less than six editions to be demanded.

It would be unfair to close this notice without a word of praise to the translator, who, in a modest note, states that his share of the work was done in leisure hours. We can only wish that he will continue, as he has begun, to introduce sterling foreign technical works to the public in as vigorous and correct English as that in which he has dressed Dr. Liesegang's little book.

R. J. F.